

Marine Gastrotrichs of the Genus *Diplodasys* (Macrodasyida: Thaumastodermatidae) from Korea

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ABSTRACT

Two marine gastrotrich species are reported from sublittoral sand bottom of Korea: *Diplodasys ankeli* Wilke, 1954 and *D. meloriae* Todaro, Balsamo and Tongiorgi, 1992. Both species are redescribed in detail, with the discussion on the intraspecific variability between Korean specimens and the original description or among Korean specimens. The genus *Diplodasys* is newly recorded from Korea as well as the Northwest Pacific.

Key words: Marine, Gastrotricha, Thaumastodermatidae, *Diplodasys*, Korea

INTRODUCTION

Genus *Diplodasys*, a unique marine gastrotrich genus with the dorsal cuticular armature of sculptured plates and lateral spines, belongs to the family Thaumastodermatidae which is the most diversified natural taxon of marine gastrotrichs. Eight species are currently recognized in the genus (Clausen, 2004). They have been reported mostly from the subtidal sediments in the Mediterranean and the Atlantic coast, except for *D. remanei* from the Waltair coast, India and *D. pacificus* from Galapagos Islands.

In the northwest Pacific, the taxonomic studies on marine gastrotrichs are still scanty, and were referred to our previous paper (Lee and Chang, 2003). So far, twelve species of five genera have been recorded from Korea (Chang et al., 1998a, b; Chang and Lee, 2001; Lee and Chang, 2002, 2003, 2004). However, the report on the genus *Diplodasys* from Korea as well as East Asia is entirely lacking.

As a result of the serial faunistic study on the marine gastrotrichs from Korea since 1997, we report two *Diplodasys* species. This paper deals with the systematic accounts of two *Diplodasys* species from Korea with redescription and illustrations of them.

MATERIALS AND METHODS

The specimens were collected from the sublittoral sand bottom at several stations along the sea coasts of Korea by scooping top sediments into polyethylene vinyl bags or 700 mL volume plastic bottles with SCUBA or skin diving.

Detailed methods for extraction from sediments, preparation of whole mounts and SEM study were given in our previous paper (Lee and Chang, 2003).

Specimens were observed using a differential interference contrast microscope (Olympus BX-50) equipped with Nomarski optics. All drawings and measurements were made with the aid of a camera lucida. Minute morphological characters like sensory hairs and inner genital organs were examined and video-recorded in living worms using a CCD camera (Olympus DP-11).

Terminology used in the description mostly follows Ruppert (1991) and Clausen (2000). Abbreviations used in text and figures are as follows: Lt=total length, from anterior tip of head to posterior tip of pedicles including adhesive tubes; U=percentage unit of Lt, used for the location (U-) from anterior to posterior, or for the relative length (-U); PhJIn=junction between pharynx and intestine; TbA=anterior adhesive tubes; TbP=posterior adhesive tubes; TbV=ventral adhesive tubes; TbVL=ventrolateral adhesive tubes.

SYSTEMATIC ACCOUNTS

Family Thaumastodermatidae Remane, 1926

Subfamily Thaumastodermatinae Ruppert, 1978

Genus *Diplodasys* Remane, 1927

Diplodasys ankeli Wilke, 1954 (Figs 1, 3A, B)

Diplodasys ankeli Wilke, 1954, p. 518, Abb. 12; Swedmark, 1956, p. 79, fig. 4; Kisielewski, 1987, p. 864, fig. 10; Todaro, 1992, p. 322, fig. 2; Todaro et al., 1992, p. 472; Balsamo et al., 1994, p. 221; Balsamo et al., 1995, p. 276; Clausen, 2000, p. 367; Clausen, 2004, p. 433, figs 11, 12.

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Material examined. Two hermaphroditic inds., Seongsan, Jeju Is., 9 Jun. 2001 (J. W. Choi).

Description. Body flattened dorsoventrally (Figs 1A, 3A), Lt 349 μ m long including TbP, distinctly divided into head, neck, and trunk. Head protruding and its anterior margin rounded, 88 μ m wide; 7-10 sensory hairs (5-8 μ m) situated along anterior margin of oral hood. Neck (13U) a little shorter than head (19U), 86 μ m wide; PhJIn at U37. Trunk region both sides nearly parallel, ending rather rectangular caudal lobe, maximum width 94 μ m.

Six to 7 epidermal glands per side aligned along lateral side from posterolateral corner of head to posterior trunk region, with irregular shape and size (9-13 μ m in diameter) (Fig. 1A).

Dorsal surface of whole body covered with cuticular armature of sculptured plates (Figs 1C, 3B); cuticular plates elliptical or rhombic, arranged in 5 columns in mid-trunk region; median column consisting of 23-24 plates; size gradually increasing posteriorly; upto anterior 13 rows of plates, each plate overlapped on posterior margin; 14th plate rather circular, without overlap; next 8-9 rows of posterior plates overlapped on anterior margin, opposite to forward plates; each plates sculptured with large central elliptical or rhombic depression and numerous small globular hollows scattered all over surface.

Lateral spines leaf-like with both sides swollen, 34-35 per side, along whole lateral body length; 3 spines located at posterolateral coner of head, foremost one minute (3 μ m long), accompanied with 2 spines (13-16 μ m long); 4 pairs situated at neck region; 27-28 pairs at trunk region.

Adhesive tubes (Fig. 1B): 33 TbA comprising transverse row with 18 tubes along ventral mouth rim and 2 groups each with 7-8 tubes medially. One pair of TbL, slender and long (20 μ m in length), flanked by antepenultimate lateral spine. TbVL 53-59 per side arranged longitudinally from anterior neck region to caudal lobes. TbP 5-6 per side, forming a pedicle, consisting of 2 distal tubes; 1 pair of medial tube inserted in middle of rectangular caudal lobe; 2-3 tubes per side on of caudal lobe.

Ventral surface covered with 14-15 columns of elliptical cuticular plates (Fig. 1D); elliptical plates gradually elongated medially, sculptured with small globular hollows, more sparse than in dorsal plates.

Remarks. Eight species are currently recognized in the genus *Diplodasys* (Clausen, 2004): *D. platydasyoides* Remane, 1927, *D. minor* Remane, 1936, *D. ankei* Wilke, 1954, *D. remanei* Rao and Ganapati, 1968, *D. pacificus* Schmidt, 1974, *D. caudatus* Kisielewski, 1987, *D. swedmarki* Kisielewski, 1987, *D. meloriae* Todaro, Balsamo and Tongiorgi, 1992. Recently, Clausen (2004) provided the tabular key to the genus on the basis of the characters as

body size and shape, number of dorsal cuticular plates, shape of caudal end, number of lateral spines at head, and number of TbA.

Diplodasys ankei, since Wilke (1954) first recorded from the *Amphioxus* sand at 5 m depth in the Naples, Italy, has been redescribed several times at other areas, that is, from littoral and sublittoral sediments in Marseilles by Swedmark (1956), from Roscoff by Kisiewleski (1987), from the Island of Ponza, Italy by Todaro (1992), from the Tuscan Archipelago by Todaro et al. (1992) and from fine, coarse shell gravel sediments at 160 m depth in the Faroe Bank, Denmark by Clausen (2004). Korean specimens were found from sublittoral coarse sand mixed with shell fragments at 23 m depth at the Jeju Island.

The Korean specimens of *D. ankei* fit well with the original description (Wilke, 1954), especially regarding body length, the arrangement and shape of dorsal cuticular plates and four lateral spines on the neck. However, Korean specimens show some discrepancies from the original description as well as the other Mediterranean. The Mediterranean specimens possess two lateral spines on head consistently except for the Danish specimens, which have one or rarely two spines, however, the Korean form possess an additional small spine anterior to the two normal lateral spines. Korean specimens are also discernible from the Mediterranean specimens in having 5-6 TbP against 10-24 TbP.

The ventral cuticular plates of Korean specimens coincide with those of the specimens from the Roscoff, France and Ponza, Italy in having central elliptical depressions, however, different from them by small hollow ornamentations around the elliptical depression (while smooth without the ornamentations in the European form).

Schmidt (1974) had described a subspecies of *D. ankei* from the Galapagos Islands, which was later regarded as a distinct species by Clausen (2004) in having (1) four lateral spines on head, (2) five neck spines, (3) shorter lateral spines (7-9.5 μ m long), (4) 7-9 TbA per side, forming two separated arcs, and (5) two discrete small caudal lobes, each with 2 terminal TbP and 1-3 additional TbP.

Distribution. Norway (Bergen, Tromsø), Denmark (Faroe Bank), Italy (Naples, Ponza, Tuscan Archipelago, Sicily, Sardinia), France (Marseilles, Roscoff, Arcachon), Korea.

***Diplodasys meloriae* Todaro, Balsamo and Tongiorgi, 1992 (Figs 2, 3C-F)**

Diplodasys minor (non Remane) *sensu* Luporini et al., 1971, p. 438, figs 3, 4.

Diplodasys meloriae Todaro, Balsamo and Tongiorgi, 1992, p. 475, figs 3, 4; Balsamo et al., 1994, p. 221.

Material examined. One ind., Hyeobjae, Jeju Is., 14 Oct.

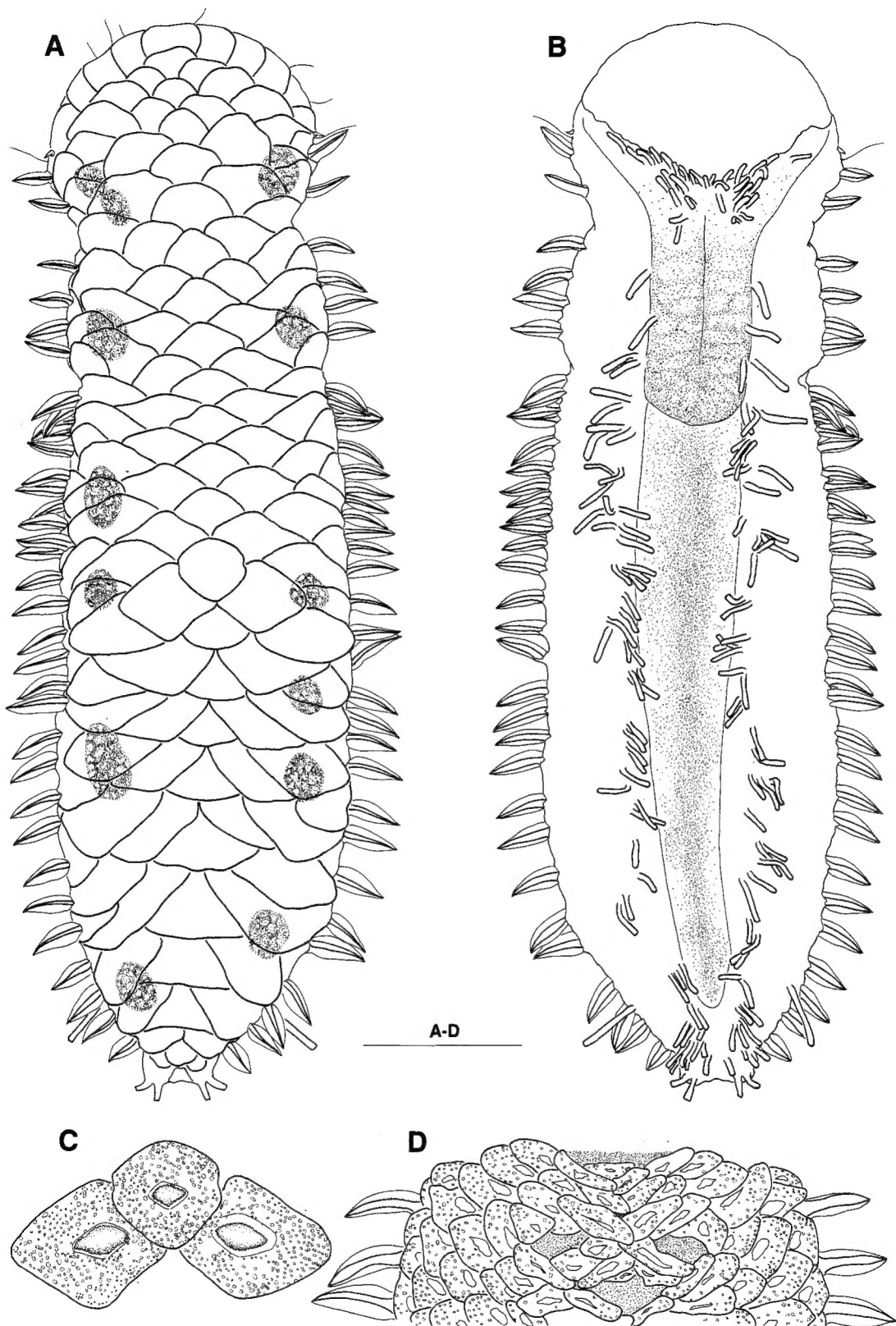


Fig. 1. *Diplodasys ankei* Wilke, 1954. A, Habitus, dorsal; B, Habitus, ventral; C, Dorsal plates; D, Ventral plates. Scale bars=50 μ m (A, B), 30 μ m (C, D).

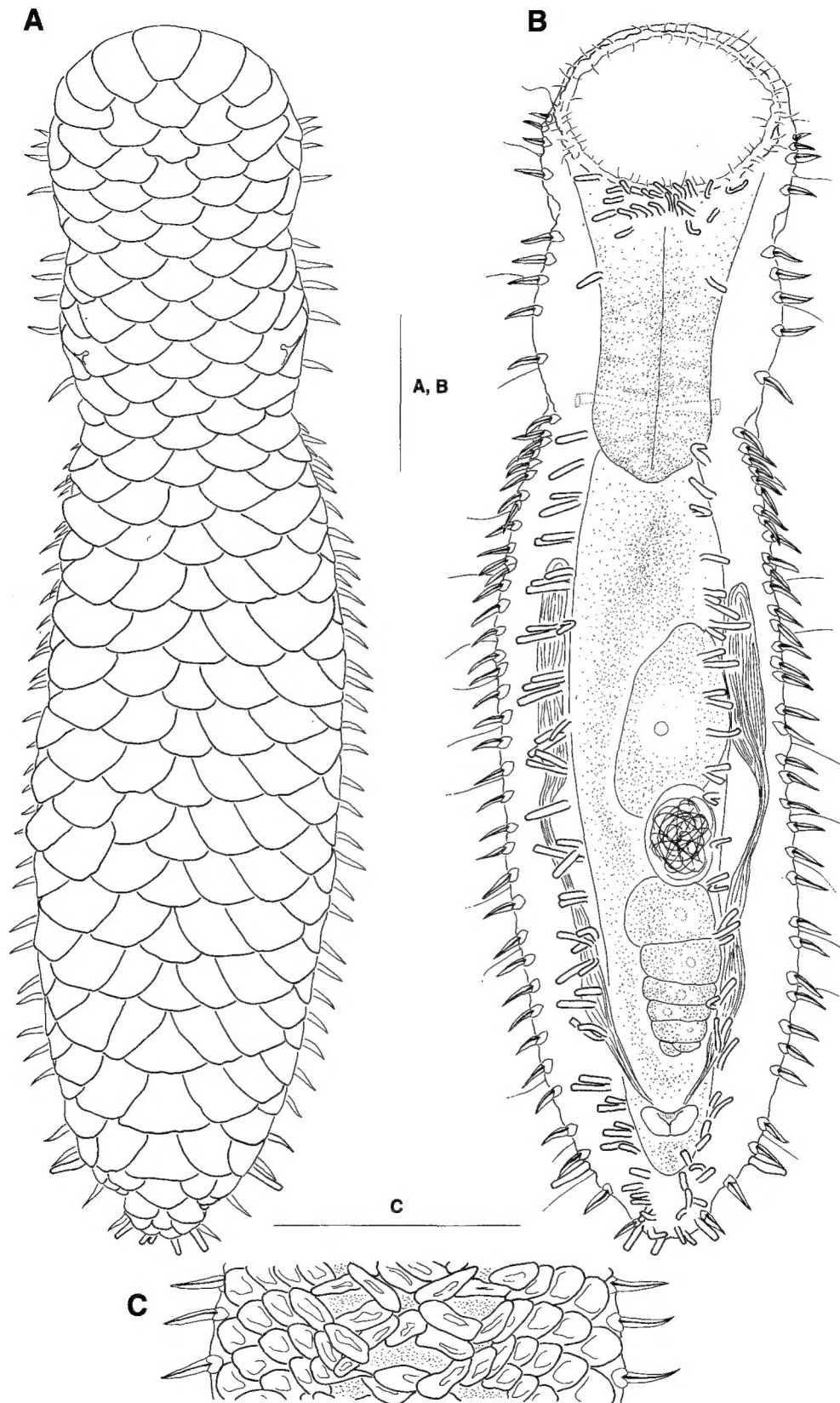


Fig. 2. *Diplodasys meloriae* Todaro, Balsamo and Tongiorgi, 1992. A, Habitus, dorsal; B, Habitus, ventral. Scale bars=50 μ m.

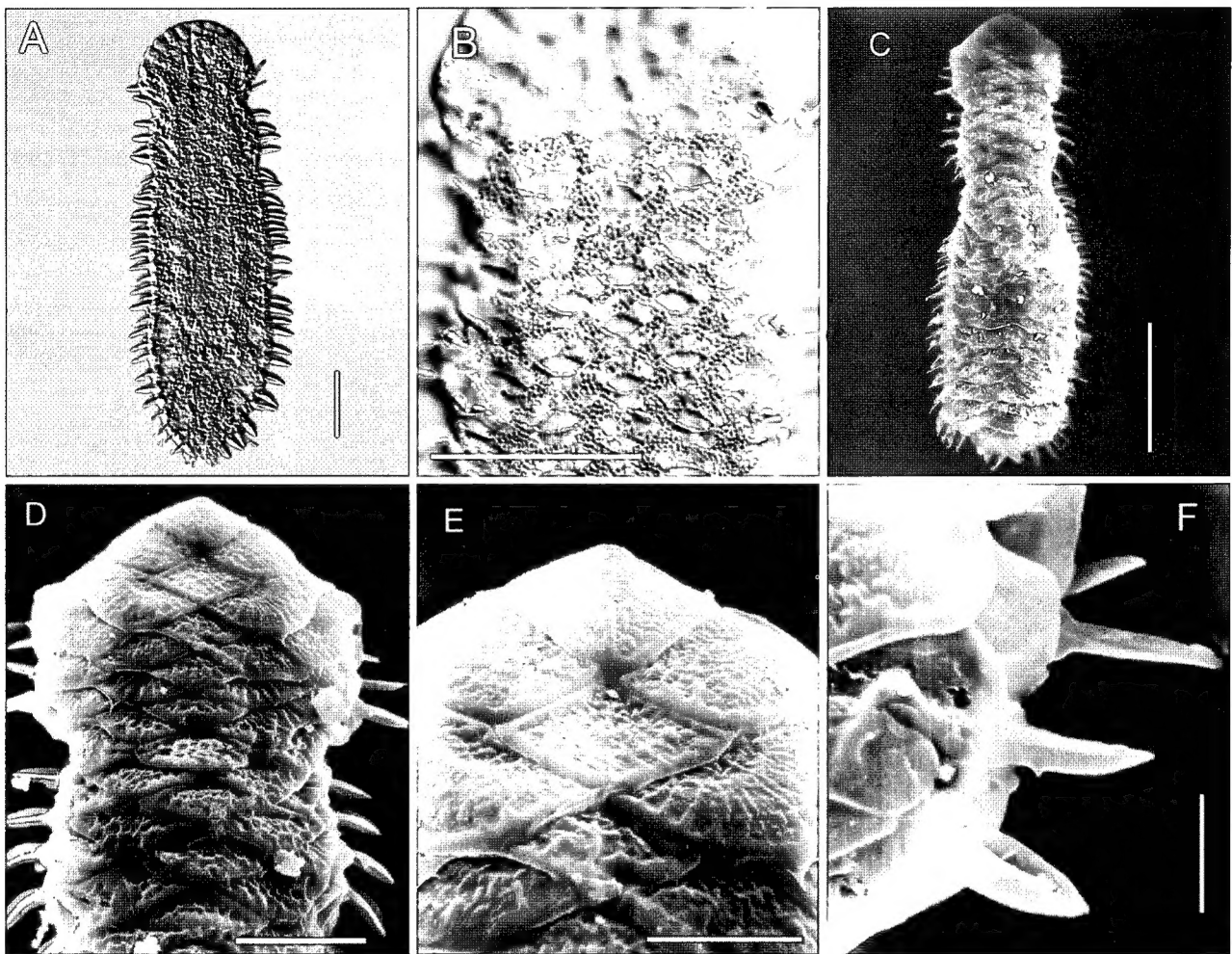


Fig. 3. A-B, *Diplodasys ankeli* Wilke, 1954 (DIC photomicrographs): A, Habitus; B, Dorsal plates. C-F, *Diplodasys meloriae* Todaro, Balsamo and Tongiorgi, 1992 (SEM photomicrographs): C, Habitus, dorsal; D, Dorsal plates on head and neck; E, Dorsal plates on the anterior portion of head; F, Lateral spines on head. Scale bars=50 μ m (A, B), 60 μ m (C), 20 μ m (D), 10 μ m (E), 5 μ m (F).

1996 (C. Y. Chang and H. S. Rho); 13 inds., Supseom Is., Jeju Is., 22 Jan. 1997 (H. S. Rho and J. W. Choi); 1 ind., Udo, Jeju Is., 26 Jun. 1997 (H. S. Rho and J. W. Choi); 1 ind., Udo, Jeju Is., 1 Mar. 1998 (J. M. Lee, H. S. Rho and J. W. Choi); 2 inds., Yangjeong, Uljin, 9 May 2001 (C. Y. Chang, J. M. Lee and Y. H. Song); 6 inds., Seongsan, Jeju Is., 9 Jun. 2001 (J. W. Choi); 4 inds., Siheung, Jeju Is., 11 Oct. 2002 (J. M. Lee and J. W. Choi); 5 inds., Yangjeong, Uljin, 9 Jan. 2003 (C. Y. Chang, J. M. Lee and G. H. An); 1 ind., Biyangdo, Udo, Jeju Is., 20 Mar. 2003 (C. Y. Chang, J. M. Lee and J. M. Jeon).

Description. Body elongate (Fig. 2A), Lt 435 μ m long, with 2 constrictions at U15 and U29, dividing into head, neck, and trunk region; width of head/neck/trunk 82/81/99 μ m. Head a little protruding and rounded. Neck apparent, nearly as long as head; PhJIn at U34. Hind margin of trunk a little

protruding, forming caudal lobe.

Dorsal surface covered with cuticular armature of sculptured plates; cuticular plates oval or rhombic, aligned in 6-7 columns in mid-trunk region; median column with 28 plates; imbricated cuticular plates, each all plates overlapped on anterior margin; anterior 4-5 plates (Fig. 3D, E) with irregular net of microsculptures all over surface; microsculptures on rest plates become gradually stronger toward posterior plates; all plates without central depressions.

Lateral spines rather narrow, 47-48 per side, arranged along whole lateral body length; 4 head spines (Fig. 3F) gradually elongated posteriorly, consisting of anterior 3 small spines (5 μ m, 7 μ m, 8 μ m long, respectively) gathering ventrolaterally and 1 longer spine (11 μ m) locating at posterolateral corner of head; 5 pairs situated at neck region; 36-37 per side (11-12 μ m long) at trunk region, last

one locating at lateral caudal lobe.

Adhesive tubes (Fig. 2B): 22 TbA comprising 3 transverse rows; anterior row with 12 tubes along ventral mouth rim; second one with 8 tubes medially; last one with only 2 tubes, apart from each other, medially. A pair of TbL, 20 μ m long, flanked by antepenultimate lateral spine. TbVL 41-51 per side arranged longitudinally; 1 TbVL locating at anterior neck region and others in trunk region; TbVL grouped as 15-16 bundles in trunk region, each of 2-3 tubes. TbP 6-12 tubes locating at caudal lobe, distally; lateralmost one longest; caudal lobe not divided as feet.

Ventral surface covered with 15-16 columns of elliptical cuticular plates (Fig. 2C); elliptical plates smooth, lacking ornamentations on surface; plates with groove gradually extending laterally.

Reproductive system (Fig. 2B): testis paired, distal end not reaching PhJn. Vas deferens straight, containing numerous spermatozoa and its posterior end approaching copulatory organ. Eight oocytes situated dorsally at mid-trunk. Copulatory organ small and trapezoid, locating at posterior trunk region. Seminal receptacle oval, locating at mid-trunk region, including motile spermatozoa.

Remarks. *Diplodasys meloriae* Todaro, Balsamo and Tongiorgi, 1992 was first reported from coarse sand mixed with shell fragments at 1.5 m depth in the Meloria, Tuscan coast, Italy by Luporini et al. (1971) in the name of *D. minor* Remane, 1936. Later, Todaro et al. (1992) collected additional specimens in the neighborhood of the locality above and designated it as a new species. *Diplodasys meloriane* closely resembles *D. minor* in having four lateral spines on head, four or five lateral spines on neck region, and seven columns of dorsal plates in trunk region. However, it differs from *D. minor* by the clearly distinguished neck region (against not clear in *D. minor*), dorsal plates with microsculptures of irregular net (against dorsal plates with central depression and 10 radial grooves reaching the posterior margin of plate in *D. minor*) and relatively large body (345-467 μ m vs. 200-350 μ m).

Korean specimens fit well with the original description recorded from Italy, especially in shape of dorsal cuticular plates, the number of lateral spines on the head and neck and caudal lobe as well as general body shape. However, the number of dorsal cuticular plates does not coincide with that of the original description (28 plates at the central column in Korean specimens versus 30-40 plates in the original description). Moreover, Korean specimens differ from the original description by one TbVL at the neck region (versus six TbVL).

Korean specimens showed some variability in the number of lateral spines on head and neck region. Two of eight specimens examined showed the deficiency of the lateral

spine, that is, one specimen lacked a spine in one side of head region, and the other did a spine in one side of neck region, showing the asymmetrical array as the result.

Distribution. Italy (Tuscan Archipelago), Korea.

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